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AUTHOR Marsh, Herbert W.
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ABSTRACT

Extending research on the Marsh/Shavelson model of self-concept, a set of 14 academic self-concept scales was related to school performance in 8 school subjects for a sample of 507 high school students. Correlations between matching areas of self-concept and achievement (0.45 to 0.70; mean r=.57) were substantial and larger than correlations between non-matching areas. Path models and multitrait-multimethod analyses further demonstrated that self-concept/academic achievement relations were very specific to particular school subjects. Different components of academic self-concept were better differentiated (less correlated) than were the corresponding academic achievement scores. The findings indicate that components of academic self-concepts are more differentiated and relations between academic self-concepts and academic achievements are more content specific than previously assumed. (Four figures illustrate the study, and a nine-item list of references is included.) (Author)

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THE CONTENT SPECIFICITY OF RELATIONS BETWEEN ACADEMIC SELF-CONCEPT AND ACHIEVEMENT: AN EXTENSION OF THE MARSH/SHAVELSON MODEL

Herbert W. Marsh, University of Western Sydney, Macarthur

Paper presented at the 1992 Annual Meeting of the
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ABSTRACT:

Extending research on the Marsh/Shavelson model of self-concept, a set of 14 academic self-concept scales was related to school performances in 8 school subjects for a sample of 507 high school students. Correlations between matching areas of self-concept and achievement (.45 to .70; mean r = .57) were substantial, and larger than correlations between nonmathcing areas. Path models and multitrait-multimethod analyses further demonstrated that self-concept/academic achievement relations were very specific to particular school subjects. Different components of academic self-concept were better differentiated -- less correlated -- than were the corresponding academic achievement scores. The findings indicate that components of academic self-concepts are more differentiated, and that relations between academic self-concepts and academic achievements are more content specific, than previously assumed.

Introduction:

The purpose of the present investigation is to extend theoretical and empirical research on the Marsh/Shavelson model of academic self-concept (Marsh, 1991; Marsh & Shavelson, 1985; Marsh, Byrne & Shavelson, 1988). Marsh, Byrne, and Shavelson (1988) tested the model with the verbal, math, and general school scales from three different self-concept instruments. A first-order factor model provided good support for the 9 a priori factors -- math, verbal, and general school factors from each of the three self-concept instruments. The critical test was whether correlations among these nine first-order factors could be adequately explained by a single higher-order factor as posited in the original Shavelson et al. model or whether two higher-order factors -- Math/Academic and Verbal/Academic -- as posited in the Marsh/Shavelson revision were required. The results showed conclusively that the Marsh/Shavelson model was superior.

Insert Figures 1 and 2

Marsh, Byrne and Shavelson noted that there was strong evidence for the inadequacy of a single higher-order academic component, but that support for the adequacy of just two higher-order academic factors was weak. Part of the problem, they argued, was that the revised model had not been presented in sufficient detail and so they offered a more detailed presentation. They posited first-order components of academic self-concept corresponding to each of the core academic subjects in a typical academic curriculum and two higher-order factors corresponding to the Math/academic and Verbal/academic components in the Marsh/Shavelson model. Support for this model requires that students can differentiate self-concepts in specific school subjects and -- assuming the that first-order factor structure is well-defined -- that correlations among the first-order factors can be adequately explained by just two higher-order factors.

Insert Figure 3

In order to more adequately test the Marsh/Shavelson model, I (Marsh, 1991) constructed the Academic Self Description Questionnaire (ASDQ) II that assessed a much more diverse variety of

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academic self-concepts than previously considered. In consultation with school administrators at the school where the research was conducted, a set of 14 school subjects taken by all students was determined. Corresponding self-concept scales were constructed for each of the different school subjects. Factor analyses identified the scales that the ASDQ II was designed to measure, demonstrating that academic self-concept is remarkably content specific. As posited, two higher-order factors were able to explain relations among core academic subjects. Additional higher-order factors were needed, however, to explain self-concepts in other, noncore subjects (e.g. Physical Education, Art and Music). Even for the core academic components, however, the hierarchy was weak and much of the variance in specific subject self-concepts was unexplained by the higher-order factors. Thus, support for the theoretical model was not interpreted to mean that academic self-concepts in subjects like computer studies, geography, history, foreign languages, and commerce can be well-represented by the two higher-order components of academic self-concept. Marsh (1991) recommended that if researchers are specifically interested in self-concepts in particular academic subjects, then they should measure self-concepts with scales specific to these subjects in addition to, perhaps, other academic self-concept scales. Perhaps the most remarkable finding was that factor analyses so clearly identified so many distinct components of academic self-concept.

The Present Investigation

The present investigation extends this earlier research by evaluating relations between specific components of academic self-concept and school performance in specific school subjects. Support for academic self-concepts in a wide diversity of specific school subjects was based on factor analyses of responses to the new ASDQ II instrument -- a within-network investigation -- but not an evaluation of the construct validity of these conclusions in relation to external criteria. The purpose of the present investigation is to relate ASDQ II scales to school performances in 8 different school subjects. It is hypothesized that academic achievement in each school subjects will correlate more highly with the corresponding academic self-concept scale than with any other self-concept scale. Adopting the terminology of multitrait-multimethod (MTMM) analysis (Campbell & Fiske, 1959), relations between academic self-concepts and academic achievements will exhibit both convergent and discriminant validity. Thus, for example, grades in English classes should correlate highly with English self-concept (convergent validity) and more highly with English self-concept than any other ASDQ scale (divergent validity).

In studies of the internal/external frame of reference (I/E) model, a path model was posited in which mathematics and verbal achievement were used to predict Math and Verbal self-concepts. The central finding was the contrasting pattern of relations of large positive path coefficients relating math achievement to Math self-concept and verbal achievement to Verbal self-concept, but small negative path coefficients relating math achievement to Verbal self-concept and verbal achievement to Math self-concept. Expanding the logic of the I/E model to incorporate the large number of academic content areas considered here, it was hypothesized that:

1. each academic achievement score would be substantially related to the matching area of self-concept and less related to other areas of academic self-concept;
2. academic self-concept scales would be more differentiated -- less correlated -- than the corresponding academic achievement scores;
3. to the extent that achievement scores contribute to nonmatching areas of self-concept, achievements in mathematics and related subjects would contribute positively to mathematics-related areas self-concept and negatively to verbal-related areas of self-concept, whereas achievements in verbal and related subjects would contribute positively to verbal-related areas of self-concept and negatively to mathematics-related areas of self-concept.

Results and Discussion:

For all 8 achievement scores, each achievement score is more highly correlated with the matching academic self-concept scale (mn $r = .57$) than with any other academic self-concept scale. These results were consistent across school grades for two different semesters and across students in different year groups. Based on these preliminary analyses, subsequent analyses are conducted on the set of correlations between the 8 achievement scores and the corresponding 8 areas of academic self-

concept. Two major analytic approaches are used to examine these relations: path models, and MTMM models used to test the convergent and discriminant validity of the relations.

CFA Path Models. Using confirmatory factor analysis, each achievement in Model 1 is related to only the matching self-concept score. For example, the path coefficient relating English achievement to English self-concept is freely estimated whereas the path coefficients relating English achievement to the remaining 7 self-concept scores are fixed to be zero. In the entire model, 8 of 64 possible path coefficients are freely estimated whereas the remaining 56 are fixed to be zero. In Model 1 the path coefficients leading from each achievement score to the matching self-concept scale are all substantial (.454 to .702; mean = .572). Using the conventional guidelines of acceptable fit (e.g., TLI > .9) Model 1 provides a very good fit to the data (TLI = .959). Hence, a model positing each academic self-concept rating to be a function of only the matching area of academic achievement fits the data very well, demonstrating that relations between academic achievement and academic self-concept are remarkably content specific. Academic self-concept in each content area is primarily a function of achievement in the matching school subject and achievements in other subjects contribute little to its prediction.

Insert Figure 4

A MTMM Analysis of Relations Between Achievement and Academic Self-concept. The correlations between the 8 achievement scores and the matching academic self-concept scores are presented in the form of a MTMM matrix (Table 1). Applying the MTMM analogy, the multiple traits are the 8 different content areas whereas the multiple methods refer to the two different constructs (academic achievement and self-concept). Whereas there are useful analogies with between this correlation matrix and a traditional MTMM matrix, there are also important distinctions. In both MTMM analyses and the present analyses, the major emphasis is on convergent and discriminant validity. Convergent validity is inferred from high correlations among matching areas of achievement and academic self-concept. Divergent validity is inferred when correlations between matching areas of achievement and academic self-concept (i.e., the convergent validities) are larger than correlations between nonmatching areas. In MTMM analysis, however, there is also an important emphasis on method effects. Thus, for example, if the correlations among traits are substantially larger when assessed by one method, the larger correlations are interpreted to be an undesirable method effect or bias. In the present application, however, each "method" refers to a different construct (academic achievement and self-concept) that are posited to be distinct. Thus, there should be substantial covariance that is specific to each construct and such a "construct" effect should not be considered a bias. In fact, an important prediction is that correlations among achievement scores should be substantially higher than correlations among academic self-concept scales. In a preliminary inspection of the MTMM matrix (Table 1) using traditional MTMM guidelines (Campbell & Fiske, 1959; Marsh, 1988a) it is observed that:

1. Convergent validities (correlations between matching areas of achievement and self-concept) are large and statistically significant for all 8 content areas (rs vary from .454 to .702; mean = .572). This supports the convergent validity of the academic self-concept ratings and matching achievement scores.
2. Convergent validities (mn r = .572) are larger than other correlations in the same row or column of the 8x8 square submatrix of self-concept/achievement correlations (.170 to .542; mn r = .332) for all 112 comparisons. This supports the divergent validity of the academic self-concept ratings and the content specificity of relations between academic self-concept and achievement.
3. Correlations among the 8 achievement scores (.417 to .724; mn r=.581) are substantially larger than correlations among the 8 academic self-concept scales (.209 to .530; mn r = .343). This supports the hypothesis that different areas of self-concept are more distinct than the corresponding areas of achievement.

Table 1
Relations Between School Achievements and Academic Self-concept in 8 Core Subjects and 6 Non-core Subjects.

	School Achievement								Core self-concepts								Non-core self-concepts					
	EN	MA	SC	HI	CO	GE	CS	FL	EN	MA	SC	HI	CO	GE	CS	FL	MU	AR	IN	RE	HE	PE
School Achievement																						
EN	---																					
MA	545	---																				
SC	664	625	---																			
HI	680	506	609	---																		
CO	724	493	649	636	---																	
GE	641	613	643	633	646	---																
CS	542	548	621	514	485	595	---															
FL	555	497	614	417	506	502	563	---														
Core self-concepts																						
EN	<642>	257	428	432	459	363	317	370	---													
MA	436	<662>	542	410	440	482	427	410	302	---												
SC	453	412	<702>	434	428	409	422	434	368	516	---											
HI	396	218	382	<495>	373	318	254	321	530	306	407	---										
CO	402	229	340	376	<541>	352	242	158	442	329	356	352	---									
GE	313	236	292	370	332	<501>	239	223	318	323	340	392	317	---								
CS	170	257	278	151	159	189	<454>	292	273	359	379	256	209	248	---							
FL	313	206	322	248	312	227	333	<575>	392	324	363	313	247	296	352	---						
Non-core self-concepts																						
MU	233	210	206	199	212	187	263	274	273	226	258	267	173	277	337	414	---					
AR	031	-014	049	069	000	094	079	116	174	114	192	232	061	199	318	268	317	---				
IN	-013	002	022	077	000	077	116	063	116	182	191	161	074	206	321	229	239	702	---			
RE	253	096	191	219	216	159	281	265	436	183	274	416	319	297	335	353	284	301	234	---		
HE	160	059	142	183	106	058	223	102	369	221	303	392	267	273	296	199	179	266	321	419	---	
PE	-082	-163	-093	003	-063	-082	-112	-170	071	042	105	117	127	125	070	-003	-033	156	262	138	497	---

Note. EN = English, MA=Math, SC=Science, HI=History, CO=Commerce, GE=Geography, CS=Computer Studies, FL=Foreign Languages, MU=Music, AR=Art, IN=Industrial arts, RE=Religion, HE=Health, PE=Physical education. All correlations are presented without decimal places. The values in < > are correlations between matching areas of self-concept and achievement, and are the "convergent validities" in the multitrait-multimethod analyses. Correlations based on noncore areas of self-concept were excluded for purpose of fitting Models 1-3 (figure 1).

CFA MTMM Models. The usefulness of inspecting MTMM matrices to infer construct validity is widely accepted, but more recently researchers have emphasized the important advantages of applying CFA models of MTMM data (e.g., Marsh, 1988a, 1989a; Widaman, 1985). For present purposes, two such models are considered.

Insert Figure 5

Model 2 (Figure 4) posits only two factors -- one latent achievement factor and one latent self-concept factor. According to this model, the relations between the achievement scores and the self-concept responses can be explained in terms of the one correlation between these two latent constructs. Whereas the size of this correlation is substantial (r = .83), the goodness of fit of this model is poor (TLI = .719).

In Model 3 relations among the 16 measured variables (the 8 achievement scores and the 8 self-concept scales) is explained in terms of one of 8 (content specific) trait factors, a general achievement factor, and a general self-concept factor (Figure 1). For both achievement scores and self-concept scales, trait factor loadings (means of .799 and .731, respectively) are consistently large for all 8 school subjects. Hence both achievement scores and self-concept ratings are largely determined by the particular content area. What is interesting to note is that the general construct factor loadings are consistently larger for achievement scores than self-concept scores (means of .460 vs. .198), whereas the residual variance terms are consistently larger for self-concept scores than for the achievement scores (means of .631 vs. .385). These results suggest that much of the residual variance in the achievement scores (i.e., variance that is independent of self-concept ratings) can be explained in terms of a general achievement factor whereas residual variance in the self-concept ratings cannot be explained by a general self-concept factor. Because the self-concept ratings are very reliable, this means that there is considerable variance in each self-concept scale that is independent of the achievement scores and the other self-concept scales. This finding is also consistent with the prediction that the self-concept scales are more distinct -- less correlated -- than the achievement scores. Consistent with the path model (Model 1 in figure 1), the MTMM analyses demonstrate that relations between academic achievement and academic self-concept are remarkably content specific.

Summary and Implications

The present investigation reflects a natural extension of empirical and theoretical trends towards considering more specific components of academic self-concept. Historically, researchers typically did not distinguish academic from nonacademic or general components of self-concept. The original Shavelson et al. (1976) model of self-concept emphasized this distinction theoretically, but offered little empirical support for it. Byrne (1984), in her classic review of within- and between-network studies, provided empirical support for the Shavelson et al model and the usefulness of an academic specific component of self-concept. The original Shavelson et al. model of self-concept hypothesized that self-concepts in specific school subjects could be explained in terms of a single higher-order dimension of academic self-concept. Subsequent research demonstrated, however, that at least two higher-order academic factors -- Math/Academic and Verbal/Academic -- were required and led to the Marsh/Shavelson revision (Marsh & Shavelson, 1985; Marsh, Byrne & Shavelson, 1988). Marsh (1991) continued this trend in a (within-network) factor analysis study showing that students have distinct self-concepts in a wide variety of specific school subjects. A key question not addressed by Marsh was whether such specific components of academic self-concept are reflected in relations with external criteria -- a between-network issue. Most previous research of relations between academic achievement and academic self-concept has been limited to relations between general measures of the two constructs or has used only one or two specific content areas to represent each construct. The present investigation is apparently unique in considering relations between academic self-concept and achievement in such a wide variety of content areas. Hence, whereas the content specificity of relations between academic achievement and self-concept found here is consistent with previous research, the findings reflect an extension of previous research

The focus of this study has been on the content specificity of self-concept/achievement correlations, but it is important to note that the sizes of these correlations are substantially larger than those typically reported (e.g., Byrne, 1984; Hansford & Hattie, 1982; Marsh, 1986). Previous research has found that self-concept/achievement relations are larger if the self-concept measures reflect academic rather than nonacademic or general components of self-concept. Hence, it is not surprising.

perhaps, that even higher self-concept/achievement correlations are found when self-concepts and achievements are measured in even more specific contents areas. This observation, however, provides further support for the content specificity of self-concept/achievement relations.

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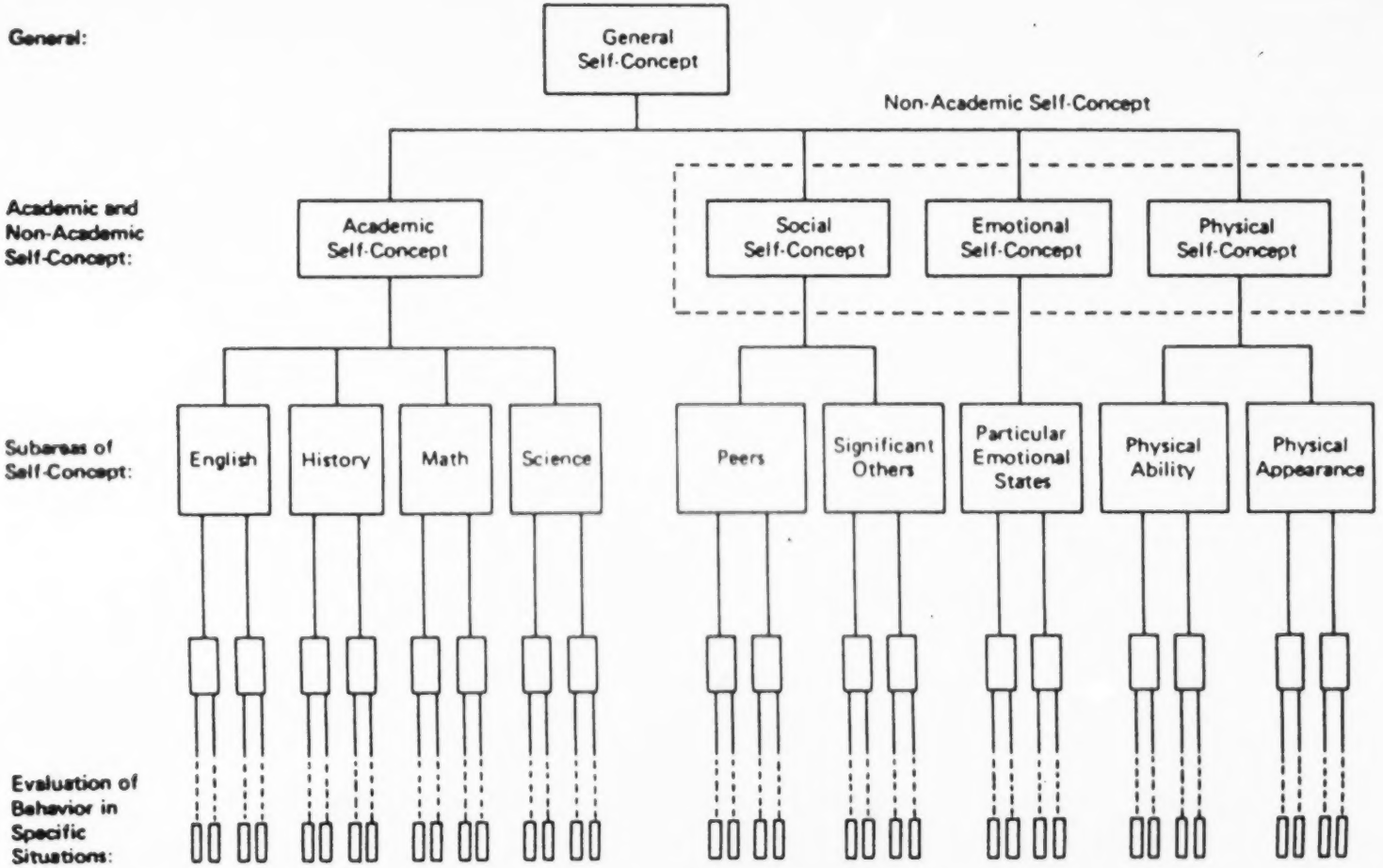


Fig. 1. One possible representation of the hierarchical organization of self-concept as posited in the original Shavelson *et al.* (1976) model of self-concept. Reprinted with permission.

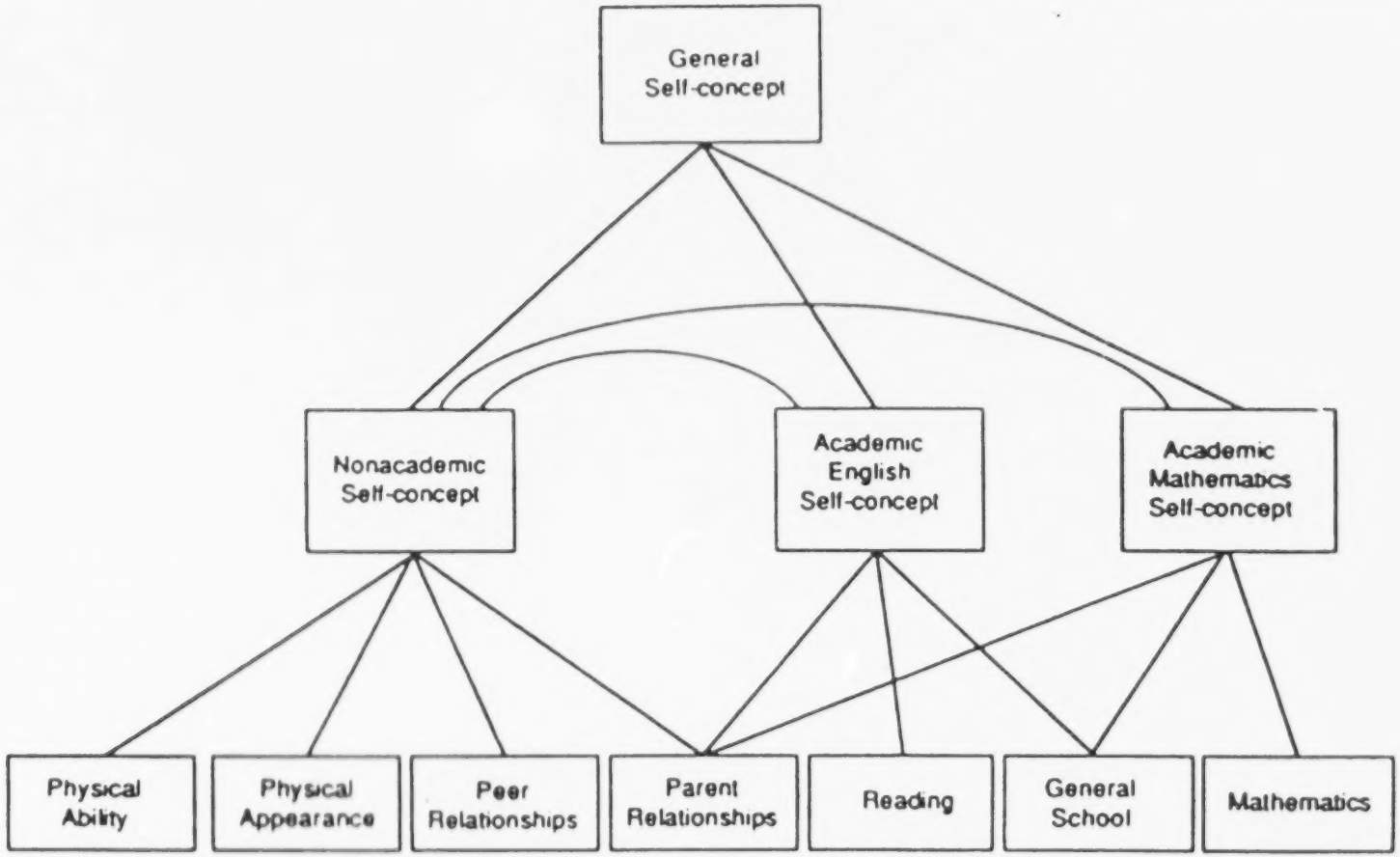
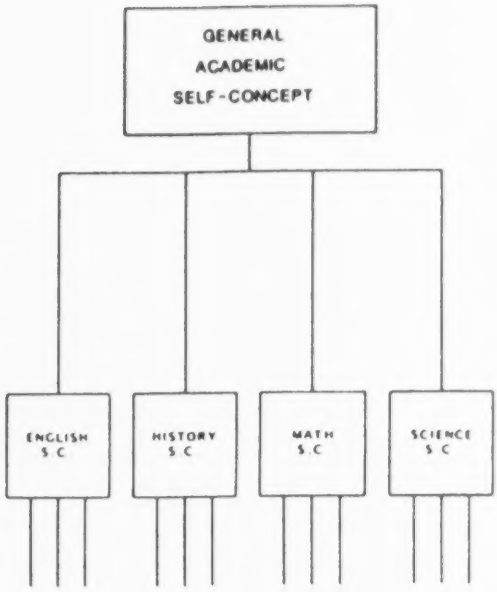


Fig. 2. An empirically based representation of the hierarchical organization of self-concept inferred from responses to the Self-Description Questionnaire I that served as the basis of the Marsh/Shavelson revision of the original Shavelson *et al.* (1976) model shown in Fig. 1. From Marsh and Shavelson (1985), adapted by permission.

A



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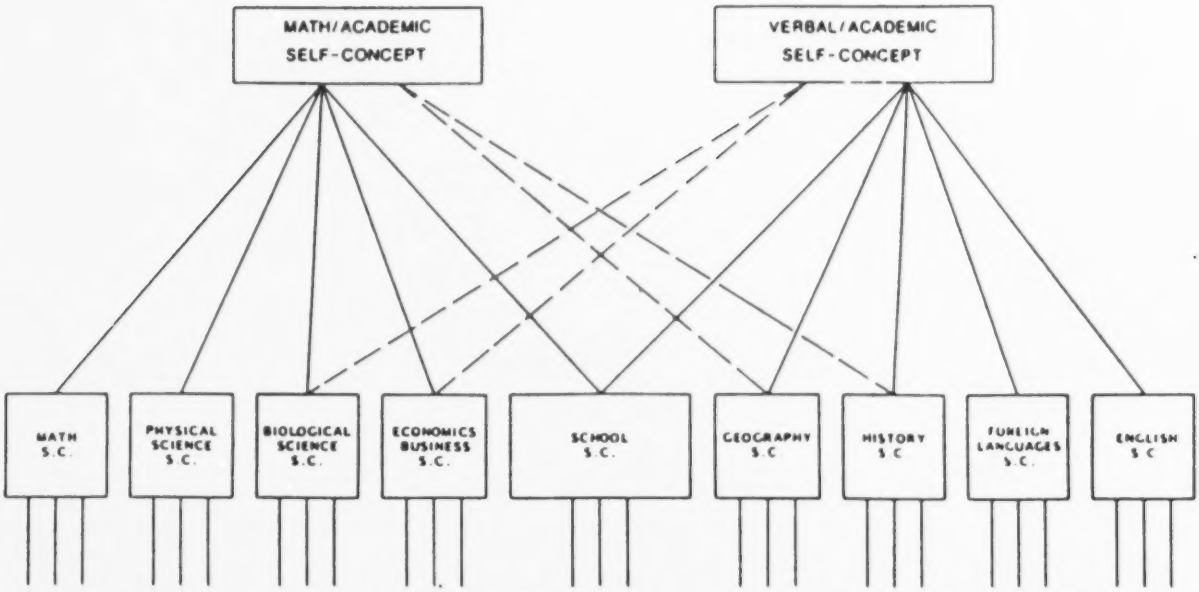
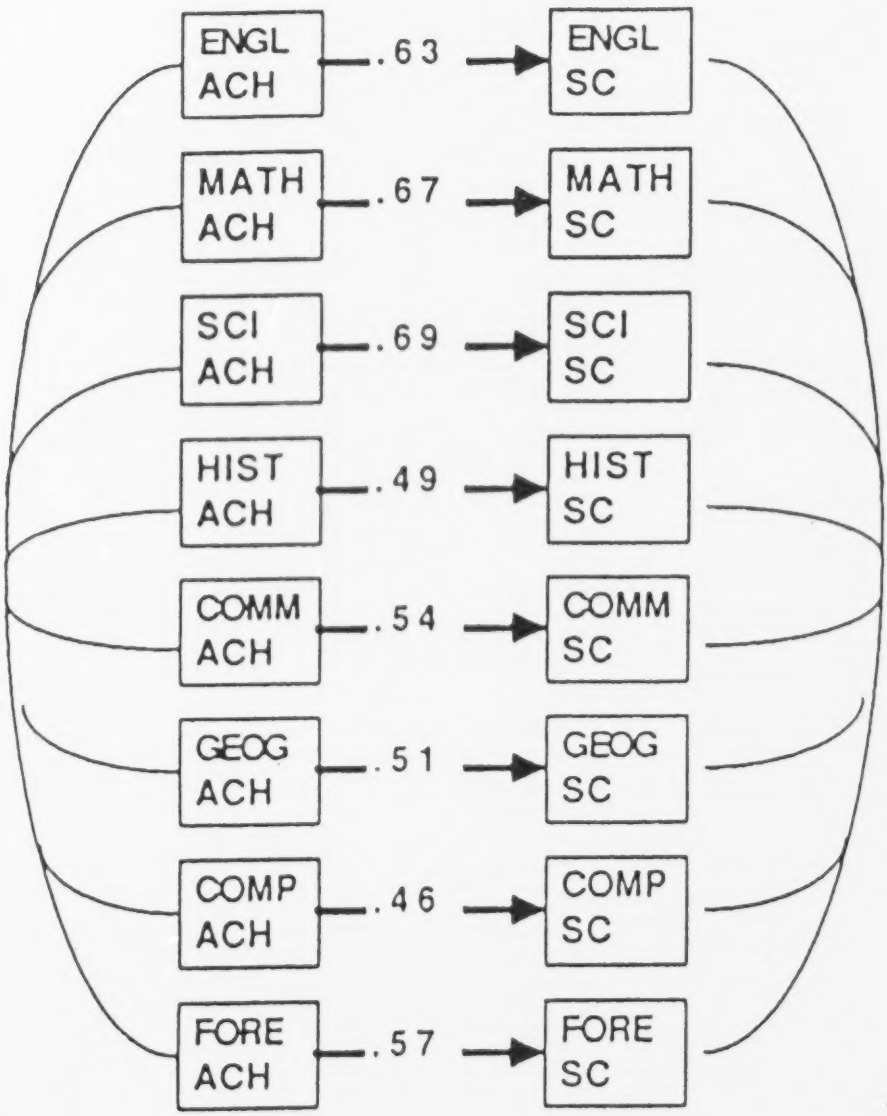
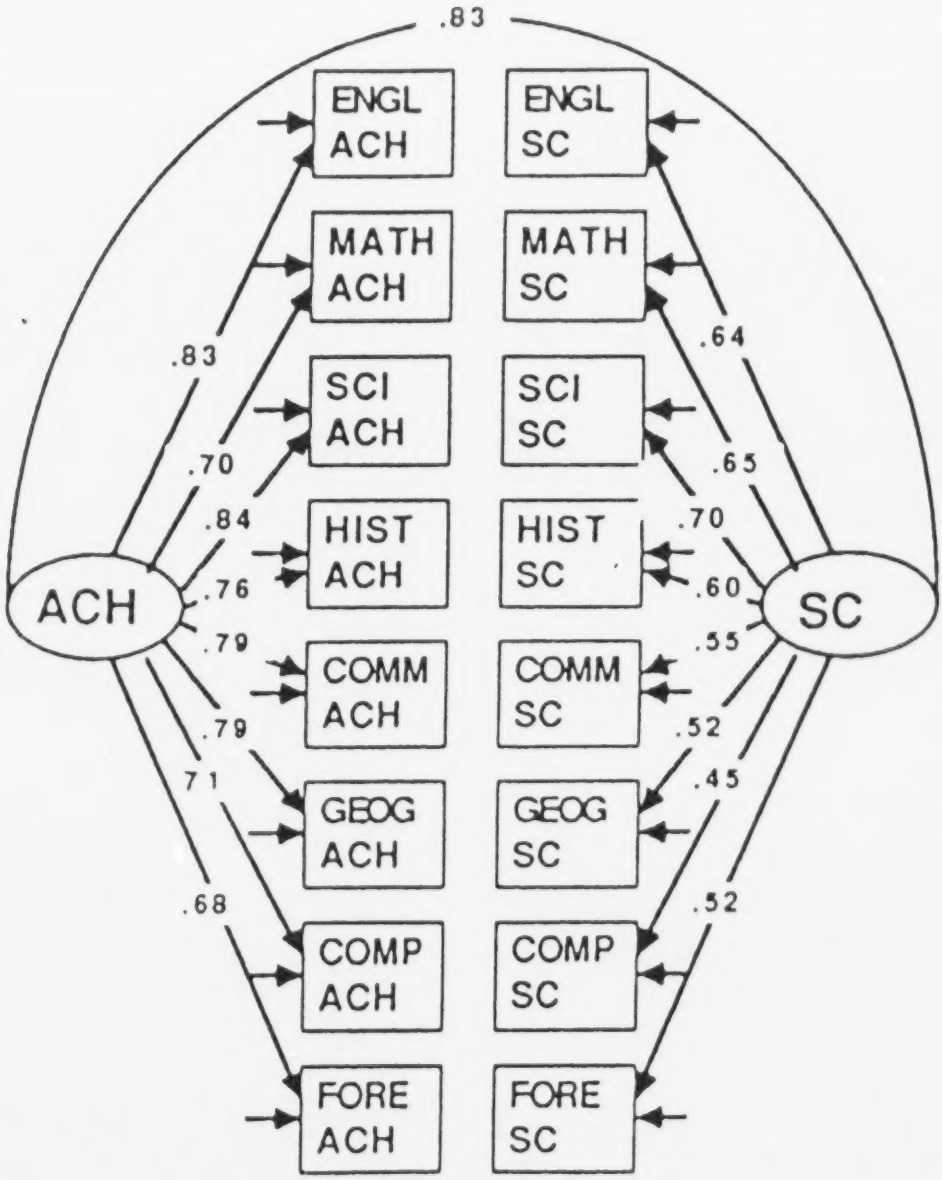


Fig. 3. The academic portion of Shavelson *et al.*'s (1976) original model (A) and a elaboration of Marsh and Shavelson's (1985) revision that includes a wider variety of specific academic facets (SC = self-concept). From Marsh *et al.* (1988), reprinted with permission.

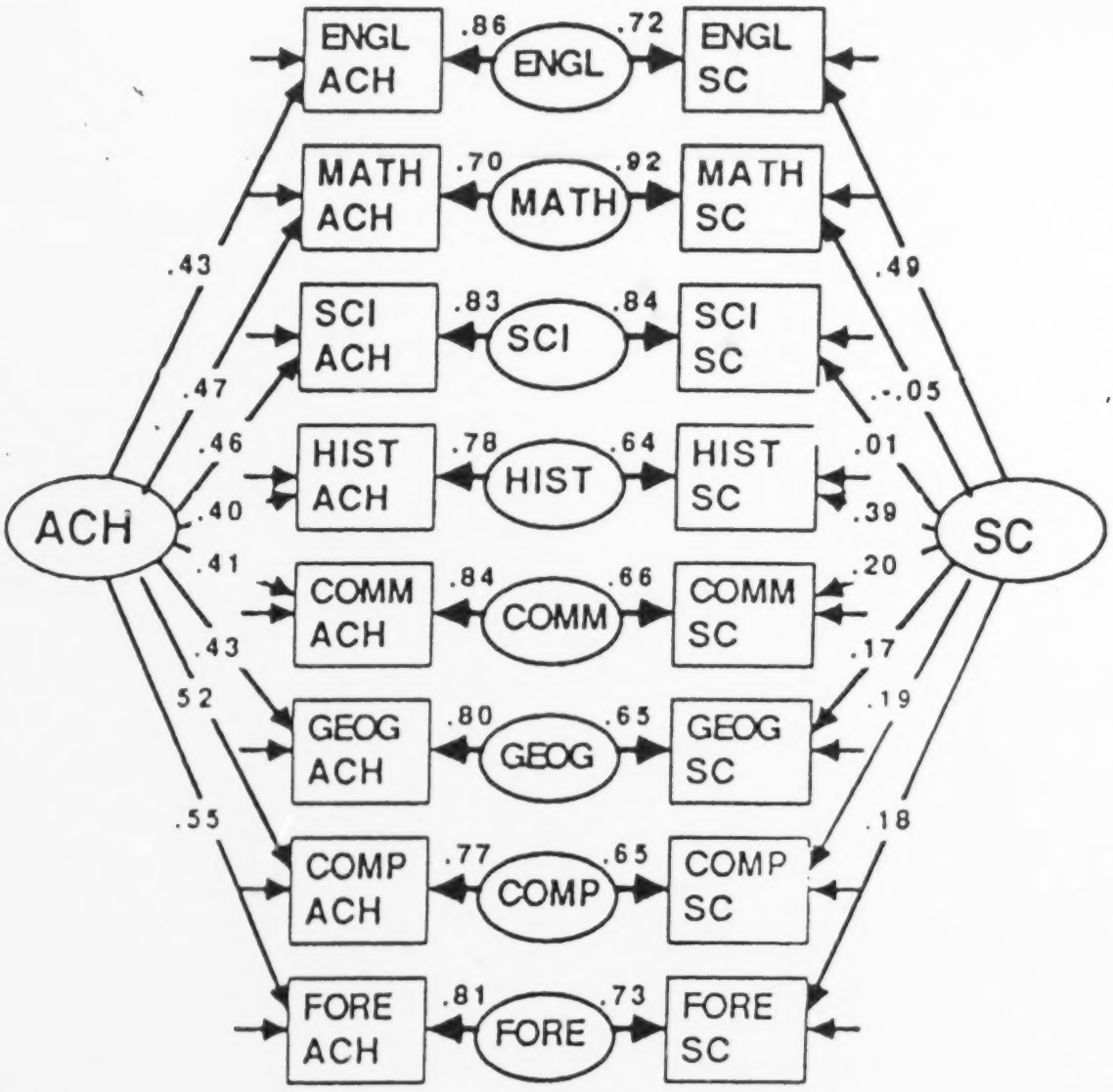
Figure 4. Three confirmatory factor Analysis Models relating 8 achievement scores to 8 academic self-concept scales. ENGL = English, MATH=Math, SCI=Science, HIST=History, COMM=Commerce, GEOG=Geography, COMP=Computer Studies, FORE=Foreign Languages, ACH=Achievement, SC=Self-concept, TLI=Tucker-Lewis Index of goodness of fit, RNI=Relative noncentrality index of fit. (In model 3, the eight content-trait factors are correlated, but these are not presented in order to avoid clutter.)



MODEL 1 X^2 (56) = 145, TLI = .96, RNI = .98.



MODEL 2 X^2 (103) = 1220 TLI = .72, RNI = .76.



MODEL 3 $X^2(60) = 139$, TLI = .97, RNI = .98.